### Evidence Statement 2006

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| **Question** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| One  (a) | ∴  DI = 13 cm | 2 Working and answer correct. |  |  |
| (b) | ∴  HI = 5 cm | 2 Working and answer correct. |  |  |
| (c) | ∴  DI = 2.9 cm. | 2 Working and answer correct. |  |  |
| (d) | ∴  HI = 1.2 cm. | 2 Working and answer correct. |  |  |
| (e) | ∴  DI = 11.25 cm. | 2 Working and answer correct. |  |  |
| (f) | ∴  DI = 2.2 cm. | 2 Working and answer correct. |  |  |
| (g) | 1.00×sin59O = 1.43×sinθR  sinθR = sin59O ÷ 1.43  θR = 36.8O = 37O . | 2 Working and answer correct. |  |  |
| (h) | 1.00×sin41O = nSALT×sin26O  nSALT = sin41O ÷ sin26O  nSALT = 1.49 = 1.50. | 2 Working and answer correct. |  |  |

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| **Question** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| Two  (a) | lamp  C  image  F | 1 Two rays drawn correctly |  |  |
| (b) | Same size, real, inverted, at centre. | 1 3 of the 4 descriptions. |  |  |
| (c) | Doubles the light from lamp directed towards the slide.– even that shining backwards from the lamp now shines forwards through the lenses and slide. | 1 More light shining to the right. | 1 A+ Doubles light. |  |
| (d) | A  slide  lamp  All the light from the lamp that strikes the lens is now travelling parallel to the principal axis. This gives a more even cover of light onto the slide. | 1 Either  Diagram  OR parallel explanation correct. | 1 Both diagram and parallel explanation. |  |
| (e) | F  F | 1 Two rays drawn  Image drawn and located. |  |  |
| (f) | Image is inverted | 1 Correct answer. |  |  |
| (g) |  |  |  |  |

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| **Question** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| Two  (h) |  | 2 Either  correct dO OR correct working with wrong dO | 2 Both processes correct giving correct do but did not convert 1.26m to 126cm (or 3.5cm to 0.035m. | 2 do, ho and working all correct. |
| (i)  F  F |  | 1 Two rays drawn correctly. | 1 Virtual rays and image located (dotted). |  |

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| **Question** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| Three  (a) | n1sinθ1 = n2sinθ2  nglasssinθglass = nbeersinθbeer  (1.5)sin(380) = nbeersin(440)  1.33 = nbeer  The beer has a refractive index 1.33.  According to the table, this means that the alcohol content is less that 3.0%  The beer is not ready to be bottled. | 2 Formula and substitution correct or process to calculate nbeer identified. | 2 nbeer correct. | 2 Answer correct supported by logical process. |
| (b) | Total internal reflection occurs when the angle of incidence of light, passing from a medium(glass) to another medium(air), is greater than θcritical .  All the **light reflects back** into the glass. | 1 All light reflected. | 1 Occurs when angle of incidence > critical angle. |  |
| (c) | nglasssinθcritical = nairsin(900)  (1.50)sinθcritical = (1.0)sin(900)  θcritical = 41.80  θcritical = 420 | 2 Formula and substitution correct. | 2 Answer correct. |  |
|  | 2 significant figures | 1 Correct. |  |  |

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| **Question** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| Four  (a) | The medium of a longitudinal/*transverse* wave moves in the same direction/*perpendicular to* the direction the wave is moving. | 1 Idea of “sideways” vs “along” given. | 1 Full explanations of directions of medium and of wave. |  |
| (b) | **Superposition** of waves occurs when **waves pass through** (interfere) **each other**. The resulting wave shape is the **addition of the amplitudes** of the individual wave shapes. | 1 Waves add up. | 1 Superposition principle or constructive interference explained. |  |
| (c) | **Refraction** of water waves occurs when the waves pass from an area of water to another with a different depth.  The waves 'bend' (refract) at the boundary between the areas because the **speed of the waves change at the boundary**  The first (bottom) part of the wave that hits the boundary slows down as **waves move slower in shallow water.** This causes the waves to ‘bend’ | 1 The term refraction is stated. | 1 The term refraction is stated **and** the waves have different speeds in different depths **and** waves move slower in shallow water. | 1 **Full explanation** and idea of wave bending due to one end slowing down before other. |
| (d) |  | 1 Circular wave fronts with limited spread on sides. |  |  |
| (e) | Diffraction | 1 Correct term. |  |  |
| (f) | The lower pitch of the waves means that the waves are of a lower frequency.  Waves with lower frequencies(surf) diffract(bend) more over the hill than waves with higher frequencies(children voices) | 1 Frequency of sound waves linked to pitch of sound. | 1 Frequency of sound waves linked to pitch of sound and difference in diffraction for different frequencies. | 1 Full and clear explanation. |
| (g) | Transverse vs longitudinal  Wave speed  Electromagnetic needs no medium | 1 One difference. | 1 Two differences. |  |
| (h) | v = λ x f  (3.0 x 108) = λ x (750 000)  (3.0 x 108)/(750 000) = λ x (750 000)/ (750 000)  400 m = λ | 2 Correct formula and substitution with 750 000 Hz. | 2 Answer correct. |  |